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KSZ8841/42/61/62-16 MQL

Demo Board User's Manual

Version 1.1

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Content

1 INTRODUCTION 5

2 HARDWARE FEATURES 5

3 CONTENTS OF THE DEMO BOARD PACKAGE 5

3.1 CONTENTS OF THE KSZ88XX-16 MQL DEMO BOARD CD-ROM 6

4 SYSTEM CONNECTIVITY 6

4.1 HOST COMPUTER REQUIREMENTS 8
4.2 DEMO BOARD 8
4.3 ICD IN-CIRCUIT DEBUGGER (RTA-FOUSB-MON) 8
4.4 SOFTWARE DEVELOPMENT TOOLS 8
4.5 OTHER CONNECTIVITY 9
4.5.1 Power Supply 9
4.5.2 Serial Port Cable Connection 9
4.5.3 Console Port Speed Setting 9

5 HARDWARE 10

5.1 DEMO BOARD 10
5.2 DEMO BOARD BLOCK DIAGRAM 11
5.3 DEMO BOARD JUMPER CONFIGURATION 12
5.3.1 Default Jumper Setting on the Demo Board 13
5.4 LED DEFINITION 13
5.5 LCD (LIQUID CRYSTAL DISPLAY) 13

6 GETTING START FOR DEMONSTRATION 14

6.1 POWER ON THE DEMO BOARD 14
6.2 SET UP IP ADDRESS FOR PC 14
6.3 CONNECT THE ETHERNET CABLE BETWEEN PC AND DEMO BOARD 15
6.4 SET THE GUI DEMO SOFTWARE 15
6.5 USE THE TCP/UDP GUI DEMO SOFTWARE FOR DEMONSTRATION 16

7 HARDWARE DESCRIPTION 18

7.1 MEMORY MAP 18
7.2 BOARD RESET 19
7.3 CLOCK SCHEME 19
7.4 ESD PROTECTION CIRCUIT 19
7.5 POT1 AND POT2 20

8 BUS INTERFACE CONNECTION 21

9 EXTERNAL INTERFACES 22

9.1 LAN INTERFACES 22
9.1.1 Two 10/100Base-TX Fast Ethernet Ports 22
9.1.2 One 100Base-FX Fast Ethernet Port 22
9.2 UART 22
9.3 ICD (IN-CIRCUIT DEBUGGER) 22

9.4 POWER JACK 22
9.5 POWER SUPPLY AND TEST POINT 22

List of Figures

Figure 1: System Connectivity with ICD for Program the OpenTCP Driver 7
Figure 2: The Parameters Settings on Hyper Terminal 9
Figure 3: The KSZ88XX-16 MQL Demo Board with all Hardware Components Filled 10
Figure 4: The KSZ88XX-16 MQL Demo Board Block Diagram 11
Figure 5: Hyper Terminal Display after Power On the Demo Board 14
Figure 6: Set Up the PC for IP Address 15
Figure 7: Input IP Address and Establish Connection for TCP/UDP Demo 16
Figure 8: Receive and Transmit TCP/UDP Packets for Demonstration 17
Figure 9: KSZ88XX-16 MQL 16-Bit Asynchronous Interface Block Diagram 21

List of Tables

Table 1: Demo Board CD-ROM Documentation list 6
Table 2: Demo Board Jumper Setting 12
Table 3: JP9 and JP10 Jumper Settings 12
Table 4: Default Setting for KSZ8841/42 Chips 13
Table 5: Default Setting for KSZ8861/62 Chips 13
Table 6: LEDs Definition 13
Table 7:Three Different Modes for Port 1 and 2 LED Status 13
Table 8: Memory Map for The Demo Board 18
Table 9: EEPROM Format and Content 18
Table 10: Format for The ConfigParam Word 6H 18
Table 11: All Test Points Description 23

Revision History

Revision	Date	Summary of Changes
1.0	05-26-05	Initial Release
1.1	06-15-05	Update for New Version A2 Silicon

1 Introduction

The KSZ88XX-16 MQL Demo Board is intended to provide a convenient way to evaluate or demonstrate the functionality and performance of these new Ethernet products from Micrel. There are four different chips with non-PCI 16-bit bus:

- KSZ8841MQL is a single copper port Ethernet MAC controller.
- KSZ8842MQL is two copper ports Ethernet Switch.
- KSZ8861MQL is a single either copper or fiber dual function port Ethernet MAC controller.
- KSZ8862MQL is two copper ports or a single copper and fiber port Ethernet Switch.

These Ethernet chips interface with the M16C processor from Renesas to use the 16-bit generic bus on the demo board.

Micrel provides a basic software driver based on the 16-bit bus solution with which to evaluate the KSZ88XX-16 MQL functionality and feature. The software includes a configuration utility to allow quick and easy device setup.

2 Hardware Features

- KSZ8841-16 MQL demo board supports the single copper port Ethernet MAC controller and 16-bit bus interface to M16C microcomputer.
- KSZ8842-16 MQL demo board supports the dual copper ports Ethernet Switch and 16-bit bus interface to M16C microcomputer.
- KSZ8861-16 MQL demo board supports the single either fiber or copper port Ethernet MAC controller and 16-bit bus interface to M16C microcomputer.
- KSZ8862-16 MQL demo board supports one copper port and one fiber port Ethernet Switch and 16-bit bus interface to M16C microcomputer.
- One 64K X 16 1-Mbit SRAM for further software code development.
- UART DB-9 connector as a console serial port.
- ICD connector for In-circuit debugger and programmer.
- One LCD module to display status of the software running and demonstration information.
- Using the demo board can demonstrate WOL (Wake-on-LAN) functionality for KSZ8841/61.
- Management two ports switch or MAC controller.
- Power LED and status LED's.

3 Contents of The Demo Board Package

The KSZ88XX-16 MQL Demo Board Kit includes:

- One KSZ88XX-16 MQL Demo Board (without RS-232 cable and Ethernet cable)
- One 5.0V/4.0A output DC power supply with 100-240 AC input
- One CD-ROM for KSZ88XX-16 MQL Demo Board documentation (see Table 1)

3.1 Contents of The KSZ88XX-16 MQL Demo Board CD-ROM

Table 1: Demo Board CD-ROM Documentation list

Items	Files	Description
1	KSZ88XX-16 MQL Demo Board User's Manual	Hardware
2	KSZ884X 16-Bit Bus BSP User's Manual	Software
3	KSZ884X Programmer's Guide	Software
4	KSZ88XX-16 MQL Demo Board Design	Schematics (both OrCAD and PDF Formats)
5	KSZ88XX-16 MQL Demo Board BOM	Bill of Material
6	KSZ884X OpenTCP/IP Driver Source Code	Software
7	TCP_GUI.EXE	TCP/DUP Demo Software
8	LinkMD.EXE	LinkMD Demo Software
9	Wake on LAN (for KSZ8841 only)	WOL Demo Software
10	PCB Layout and Gerber file	Board Layout for all Layers
11	Datasheet for KSZ8841MQL	PDF Format
12	Datasheet for KSZ8842MQL	PDF Format
13	IBIS Models	Hardware
14	Linux 2.6 Driver	Software
15	Vxworks Driver	Software
16	Renesas tool chain for ICD	Software

Note: These documents are preliminary.

4 System Connectivity

Figure 1 shows the connectivity for program OpenTCP driver or development. The following lists the hardware and software products that are required by the Demo Board to program OpenTCP driver or download the update OpenTCP driver.

- Host Computer
- KSZ88XX-16 MQL Demo Board
- +5V DC Power Supply
- RTA-FoUSB-MON In-Circuit Debugger (sold separately)
- Mini USB Cable (sold separately)
- Target Cable (sold separately)
- Software Tools (FoUSB Programmer and other development tools)

Note: RTA-FoUSB-MON ICD, Mini USB Cable and Target Cable are ordered and manufactured from Renesas Technology America, Inc. (www.renesas.com)
Address: 450 Holger Way, San Jose, CA 95134-1368 USA
Phone: 408-382-7500, Fax: 408-382-7501

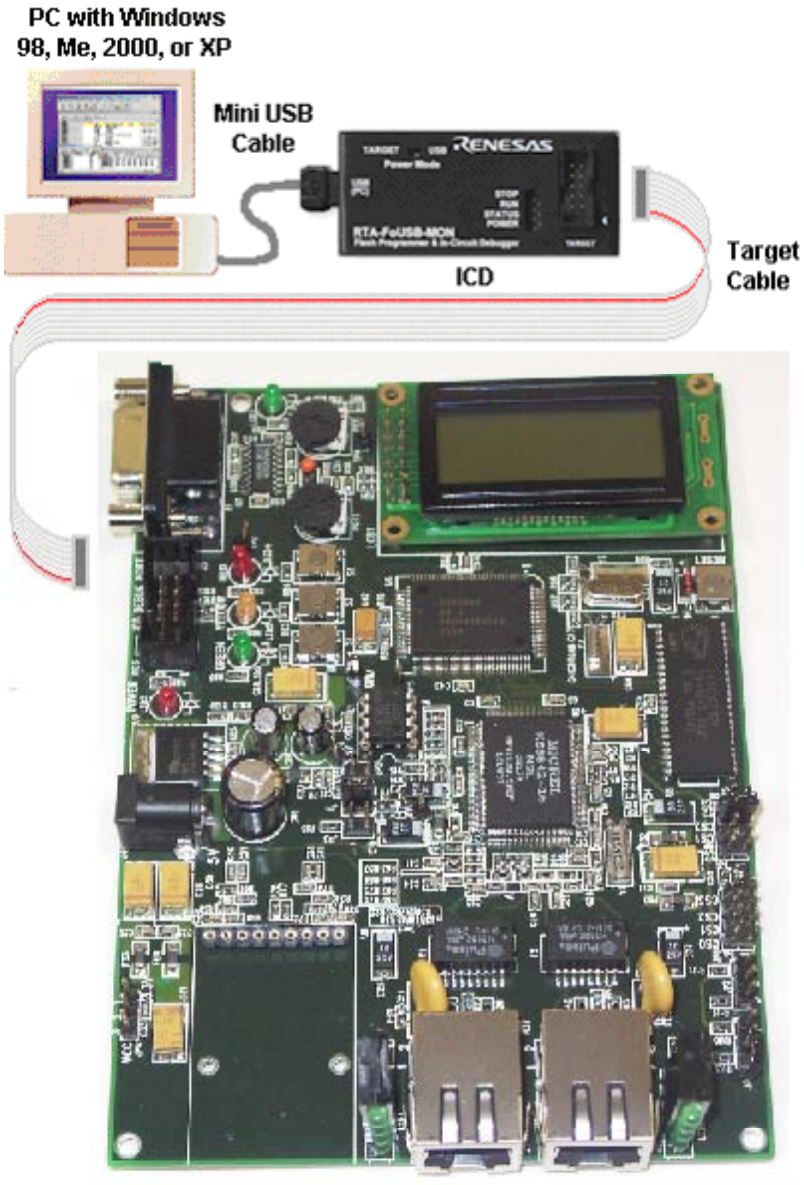

Figure 1: System Connectivity with ICD for Program the OpenTCP Driver

After program the OpenTCP driver, the demo board will be a standard alone two-port switch or a single port MAC controller with microprocessor and management function.

4.1 Host Computer Requirements

The minimum PC requirement for running the software and the Demo Board is an USB port, serial RS232 port and Microsoft Windows 98, ME, 2000, or XP.

4.2 Demo Board

The Demo Board provides an evaluation and development environment for KSZ88XX-16 MQL Ethernet switch or MAC controller with a 16-bit host bus interface. It has push button switches, LED's and LCD for user interfaces. Two 10/100Base-TX fast Ethernet ports and one 100Base-FX port are available for different modes of Ethernet connection.

4.3 ICD In-Circuit Debugger (RTA-FoUSB-MON)

Micrel has programmed the OpenTCP device driver into the Demo Board for demonstration purposes, so the user can use the Demo Board to run demo software "**TCP_GUI**" or "**LinkMD**" on the Demo Board.
If you want to use the Demo Board as a development platform and program the flash in the M16C Microcomputer, you need to order the part RTA-FoUSB-MON from Renesas or its distributors. The part can perform debugging and programming of the Demo Board by using the host computer's Universal Serial Bus (USB). The Demo Board will provide power to the RTA-FoUSB-MON. When connecting the ICD to the Demo Board ensure that the power source switch on the RTA-FoUSB-MON is in the "**TARGET**" position. If the switch is left at "USB" Powered Mode, some MCU pins may be driver to undesirable levels.

4.4 Software Development Tools

For details of the software development tools and programs, please refer to " Micrel KSZ884X 16-Bit BSP User's Manual ".

4.5 Other Connectivity

4.5.1 Power Supply

A single +5V DC power supply is used only from this demo kit and plugs into the power jack J4 on the Demo Board.

4.5.2 Serial Port Cable Connection

A serial female to male cable is used in the demo kit. The cable is connected between the RS-232 port of the PC and the serial port of the Demo Board. From the console port in the PC, the user can read/write to registers, send packets and display MIB counters, etc.

4.5.3 Console Port Speed Setting

The serial port data transfer is set the speed at 38400 Bits/Second for normal display in ether a Hyper Terminal or other tools. Figure 2 shows all parameters setting on the Hyper Terminal.

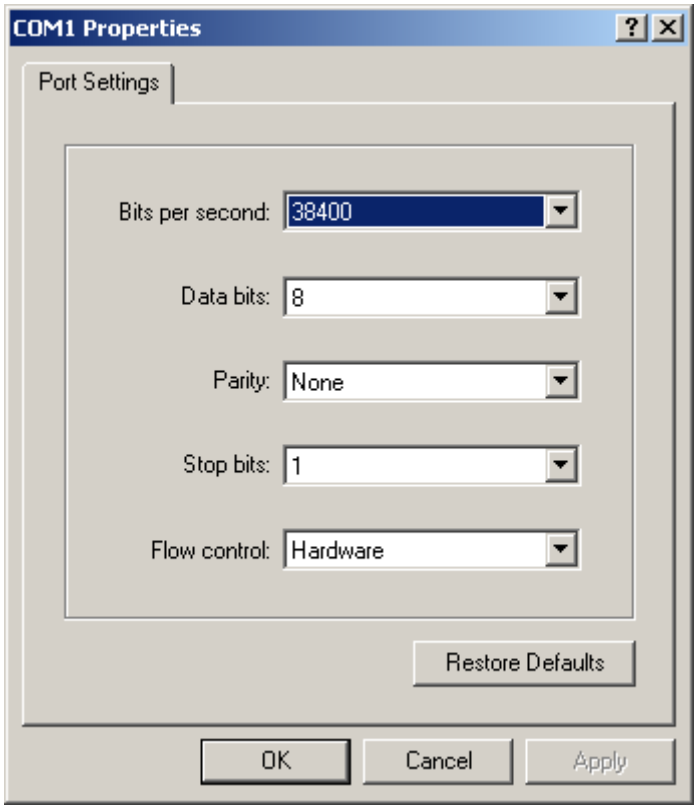

Figure 2: The Parameters Settings on Hyper Terminal

5 Hardware

5.1 Demo Board

The KSZ88XX-16 MQL Demo Board is shown in the Figure 3.

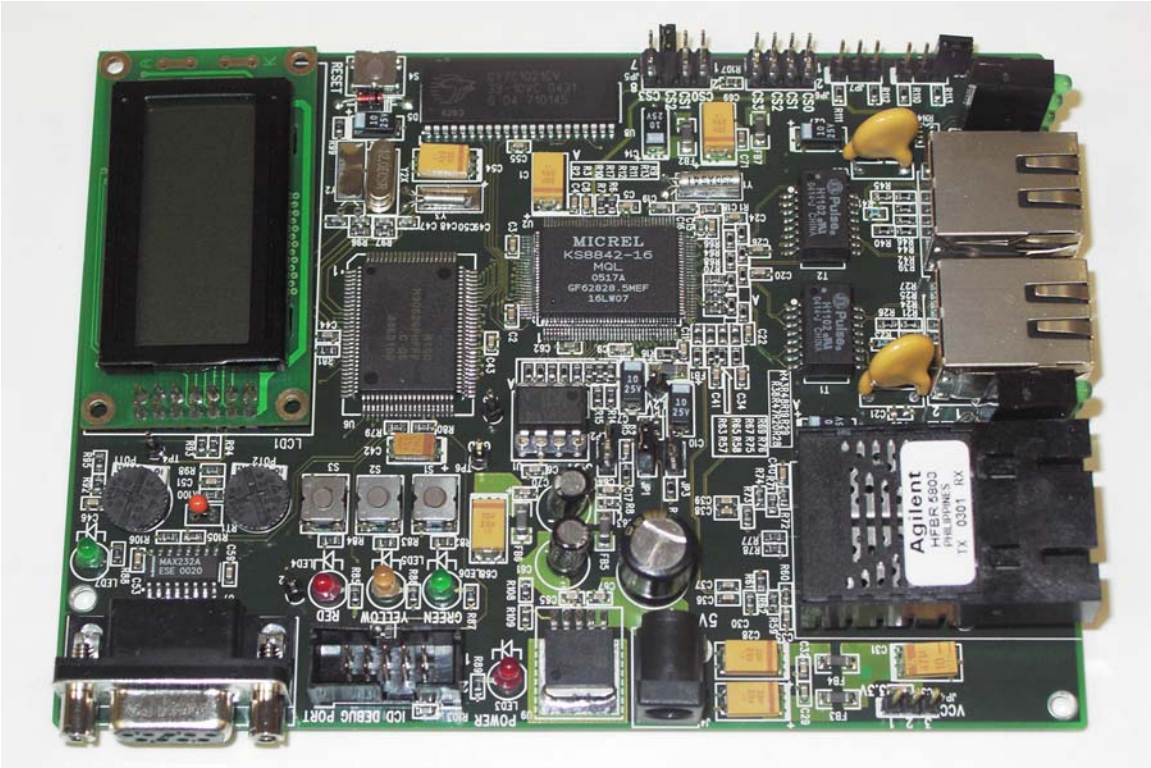

Figure 3: The KSZ88XX-16 MQL Demo Board with all Hardware Components Filled

5.2 Demo Board Block Diagram

The detail top view of the Demo Board block diagram is shown in Figure 4.

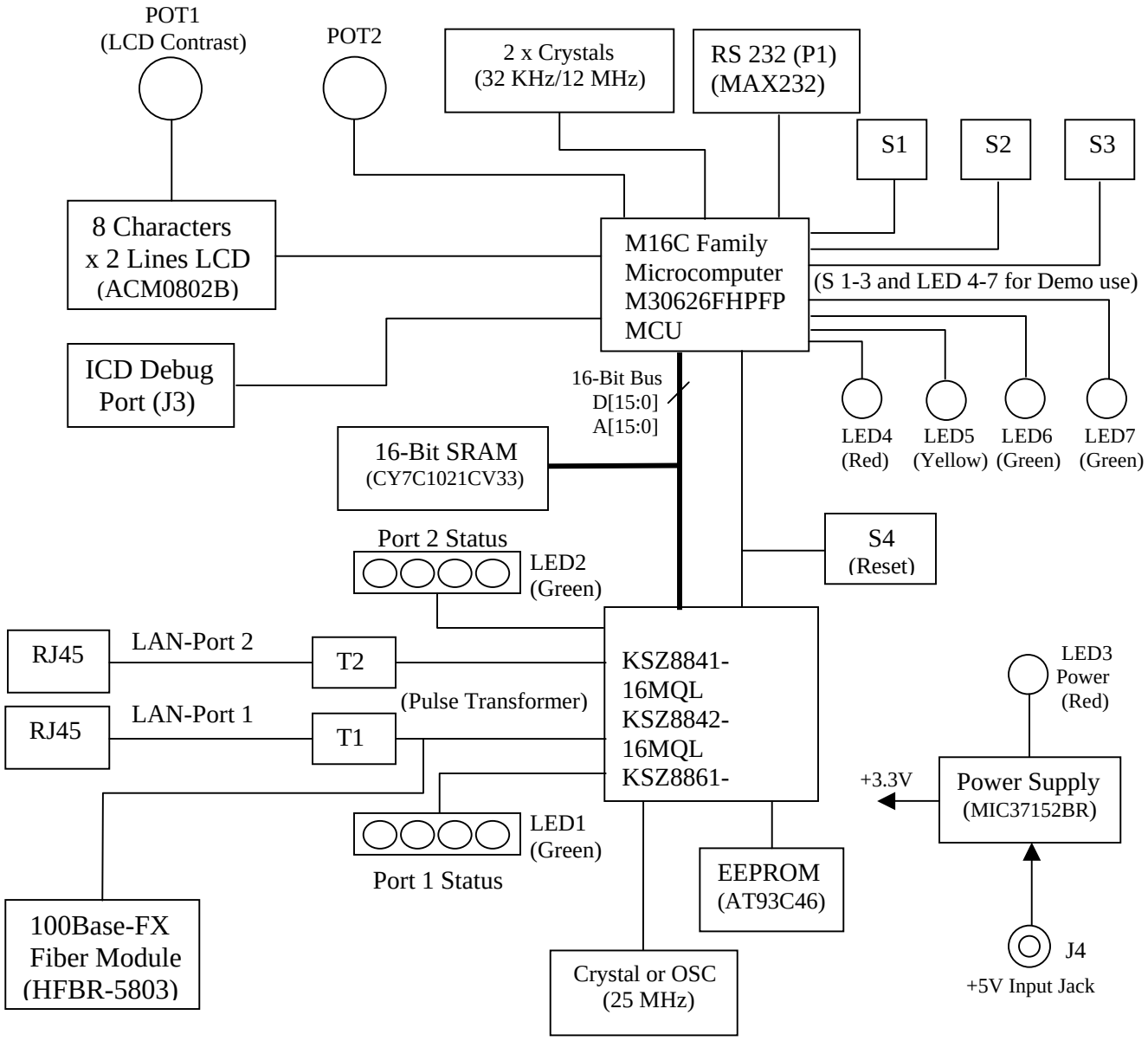

Figure 4: The KSZ88XX-16 MQL Demo Board Block Diagram

5.3 Demo Board Jumper Configuration

The following Tables 2 and 3 show all the jumper settings for the Demo Board.

Table 2: Demo Board Jumper Setting

Jumper	Setting KSZ8841	Setting KSZ8842	Setting KSZ8861	Setting KSZ8862	Comment
JP1 (2-pin)	ON	ON	OFF	OFF	This jumper is used to select copper or fiber for port 1. ON: for KSZ884X, OFF: for KSZ886X
JP2 (2-pin)	ON	OFF	ON	OFF	ON: with power management to use Wake up on LAN for KSZ8841/61 OFF: without power management for KSZ8842/62
JP3 (2-pin)	OFF	OFF	OFF	OFF	ON: for full-chip power down OFF: for normal operation
JP4 (3-pin)	OFF	OFF	1-2	1-2	1-2 for 3.3V fiber module, 2-3 for 5V fiber module. OFF: for KSZ884X
JP5 (8-pin)	CS2	CS2	CS2	CS2	5-6 for KSZ88XX chip select (CS2)
JP6 (8-pin)	CS0	CS0	CS0	CS0	1-2 for SRAM chip select (CS0)
JP7 (3-pin)	OFF	OFF	OFF	OFF	No connect for normal operation Connect 1-2 or 2-3 for test purpose
JP8 (3-pin)	OFF	OFF	OFF	OFF	No connect for normal operation Connect 1-2 or 2-3 for test purpose

Note: Pins 3-4 (CS1) and 7-8 (CS3) are no connect for both JP5/JP6

Table 3: JP9 and JP10 Jumper Settings

Jumper	Setting KSZ8841	Setting KSZ8842	Setting KSZ8861	Setting KSZ8862	Comment
Normal Operation with EEPROM					
JP9 (2-pin)	ON	ON	ON	ON	With EEPROM (refer to Table 9/10 for bus selection)
JP10 (2-pin)	OFF	OFF	OFF	OFF	OFF: Normal operation ON: Illegal operation
8-bit or 16-bit Operation without EEPROM					
JP9	OFF	OFF	OFF	OFF	Without EEPROM
JP10	ON	ON	ON	ON	ON: for 16-bit bus interface Off: for 8-bit bus interface (32-bit bus, KSZ88XX-32MQL, don't care this setting)

Note: Pin 1 of JP9 connects to EEEN (pin 26); pin 2 of JP9 connects to 10K pull up.
Pin 1 of JP10 connects to EEDI (pin 30); pin2 of JP10 connects to 10K pull up.

5.3.1 Default Jumper Setting on the Demo Board

Table 4: Default Setting for KSZ8841/42 Chips

Jumper	JP1	JP5
Setting	Shorted for copper port	5-6 Shorted for CS2

Table 5: Default Setting for KSZ8861/62 Chips

Jumper	JP1	JP4	JP5
Setting	Opened for fiber port	1-2 shorted for 3.3V Fiber module	5-6 Shorted for CS2

5.4 LED Definition

Table 6 shows the Demo Board LED definition.

Table 6: LEDs Definition

LED	Color	Description
LED1	Green	Group of 4-LED for Port 1 Status
LED2	Green	Group of 4-LED for Port 2 Status
LED3	Red	+5V Power LED indicator
LED4	Red	For HW/SW demo LED
LED5	Yellow	For HW/SW demo LED
LED6	Green	For HW/SW demo LED
LED7	Green	Received WOL packet LED indicator

Port 1 and 2 status LED indicators are programmable via the register to three different modes, as described in Table 7 below.

Table 7:Three Different Modes for Port 1 and 2 LED Status

Mode 0 (Default)	Mode 1	Mode 2
LED3= No define	LED3= No define	LED3= Act
LED2= Link/Act	LED2= 100 Link/Act	LED2= Link
LED1= Full duplex/Col	LED1= 10 Link/Act	LED1= Full duplex/Col
LED0= Speed (on 100/off 10)	LED0= Full duplex	LED0= Speed (on 100/off 10)

5.5 LCD (Liquid Crystal Display)

The LCD Module (ACM0802B) is a 2-line by 8-character display to use for demo received packet or HW/SW status.

6 Getting Start for Demonstration

6.1 Power on the Demo Board

If user needs to update the OpenTCP driver, they can read the Chapter 4 to download the update driver, otherwise user just connects the RS-232 serial cable between the PC and the Demo Board. On the PC, open the Hyper Terminal and configure the speed to 38400 Bits/Second as shown in Figure 2, then plug in the 5V DC jack to power on the Demo Board. Normally the Hyper Terminal window will display as shown in Figure 5.

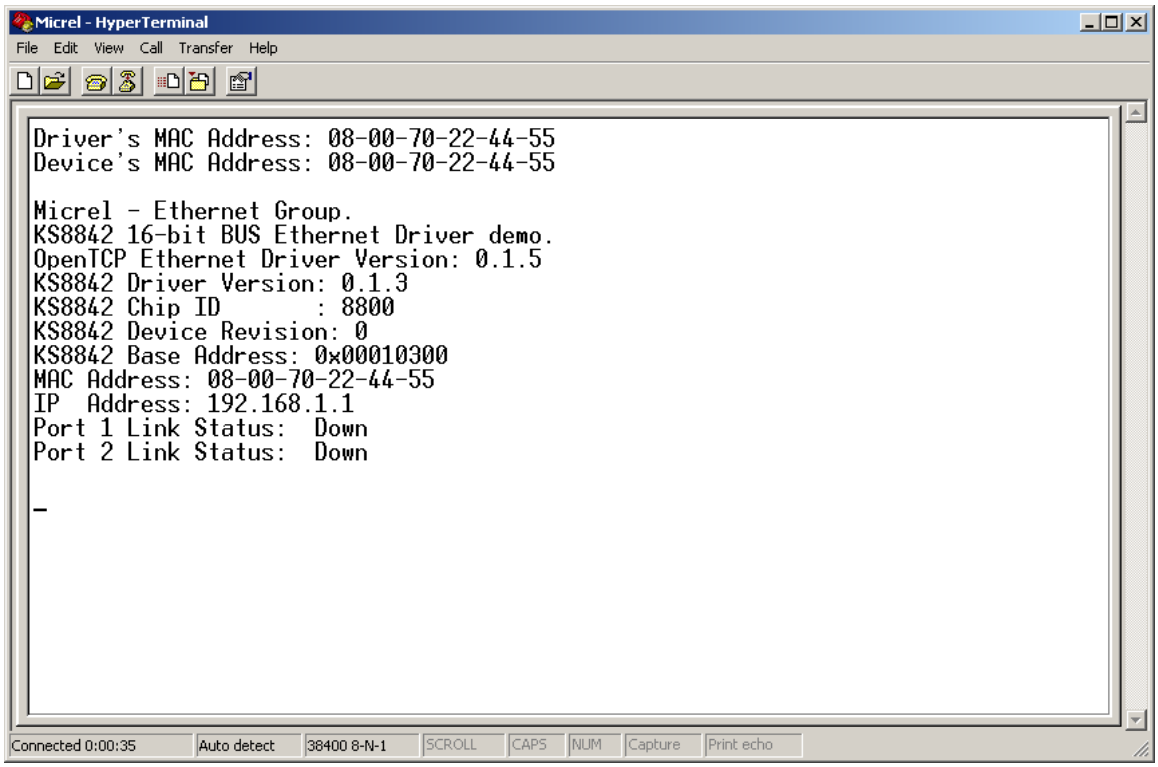

Figure 5: Hyper Terminal Display after Power On the Demo Board

In this window, press "Enter" and type "=>hwhelp" to show all commands and parameters that can read/write to registers, configure the chip, display MIB counters and send packets, etc.
From this window, the software has assigned the IP and MAC addresses in the Demo Board. IP Address: 192.168.1.1
Switch Host MAC Address: 08-00-70-22-44-55

6.2 Set Up IP Address for PC

This section describes how to change IP address for your PC in order to run the TCP_GUI demo software and the demonstration for KSZ88XX-16 MQL Ethernet

chip. Due to the default value of IP address is 192.168.1.1 in the Demo Board. For the PC, the user can set the IP address to 192.168.1.X (X: don't care) and the Subnet mask to 255.255.255.0 (see the Figure 6).

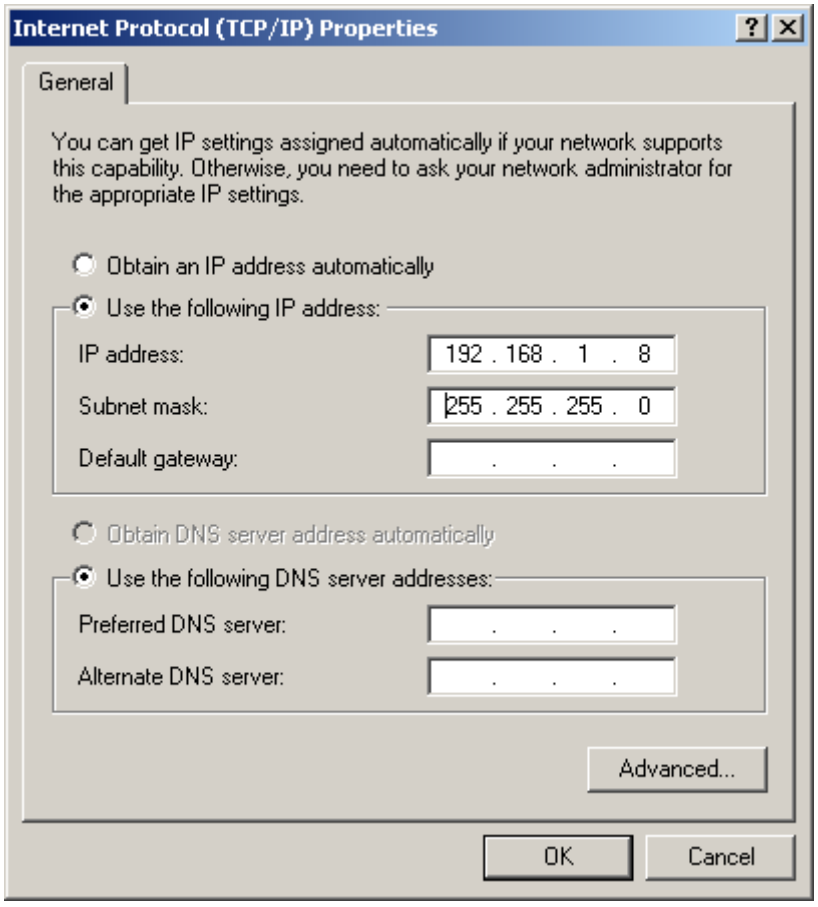
Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
192 . 168 . 1 . 8
Subnet mask:
255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

Figure 6: Set Up the PC for IP Address

6.3 Connect the Ethernet Cable between PC and Demo Board

Use an Ethernet cable to connect between the PC and the Demo Board 10/100Base-TX Ethernet ports.

6.4 Set the GUI demo software

Double click the "TCP_GUI.EXE" demo software; the "TCP/DUP demo" window comes up as shown in Figure 7. Type the IP address "192.168.1.1" in the "IP Address of Board" area and click the "Establish connection" button. If "**Connected"** message is displayed below the IP Address, the connection is successfully.

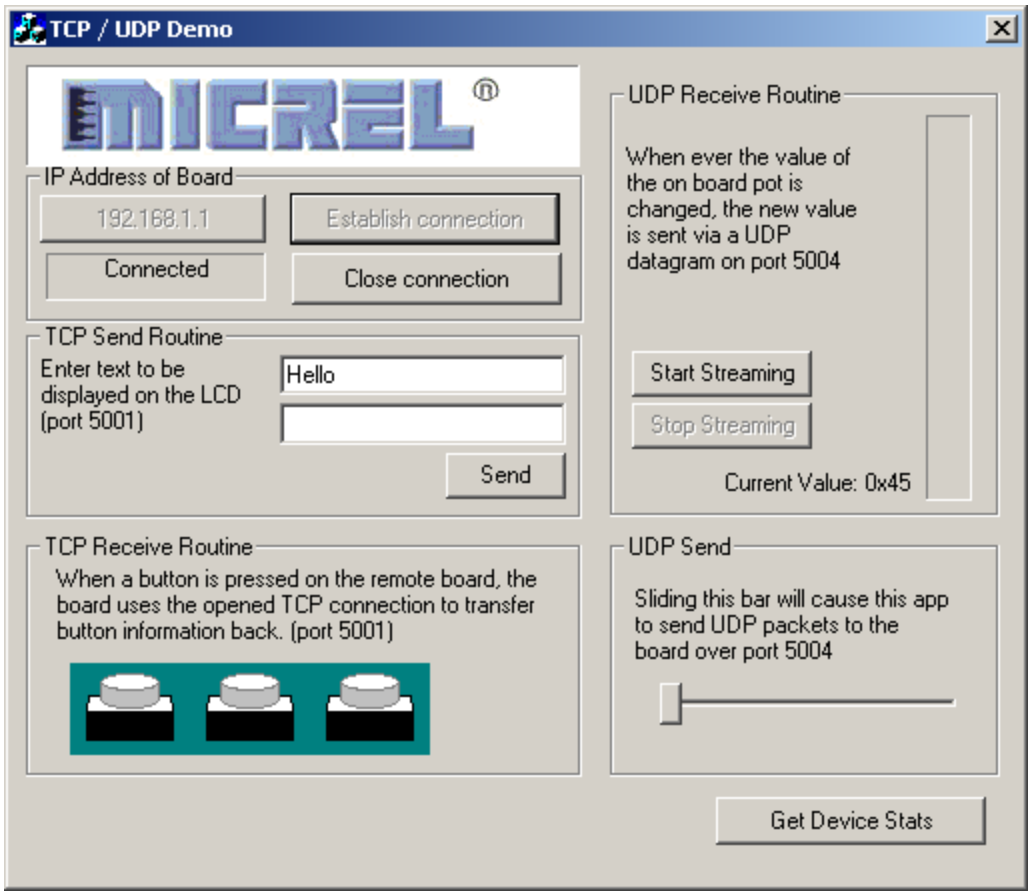
TCP / UDP Demo
IP Address of Board
192.168.1.1
Establish connection
Connected
Close connection
TCP Send Routine
Enter text to be displayed on the LCD (port 5001)
Hello
Send
TCP Receive Routine
When a button is pressed on the remote board, the board uses the opened TCP connection to transfer button information back. (port 5001)
UDP Receive Routine
When ever the value of the on board pot is changed, the new value is sent via a UDP datagram on port 5004
Start Streaming
Stop Streaming
Current Value: 0x45
UDP Send
Sliding this bar will cause this app to send UDP packets to the board over port 5004
Get Device Stats

Figure 7: Input IP Address and Establish Connection for TCP/UDP Demo

6.5 Use the TCP/UDP GUI Demo Software for Demonstration

Figure 8 shows the Send and Receive TCP/UDP packets GUI window.
For sending TCP packets from PC to Demo Board, type any 1 to 8 characters/numbers into two blanks under "TCP Send Routine" and click the "Send" button. The characters/numbers text will be displayed at the LCD module of the Demo Board.
For receiving TCP packets from Demo Board to PC, press any one of the three push button switches (S1, S2 and S3) on the Demo Board. The "TCP Receive Routine" area will display the action from the Demo Board.
For receiving UDP packets from Demo Board to PC, click the "Start Streaming" button in the "UDP Receive Routine" area, then adjust POT2 (10K variable resistor) on the Demo Board. The GUI demo window on the PC will display the current value.
For sending UDP packets from PC to Demo Board, use the mouse to slide the bar in "UDP Send" area. The position of the slide bar will be displayed as a percentage on the LCD module of the Demo Board.

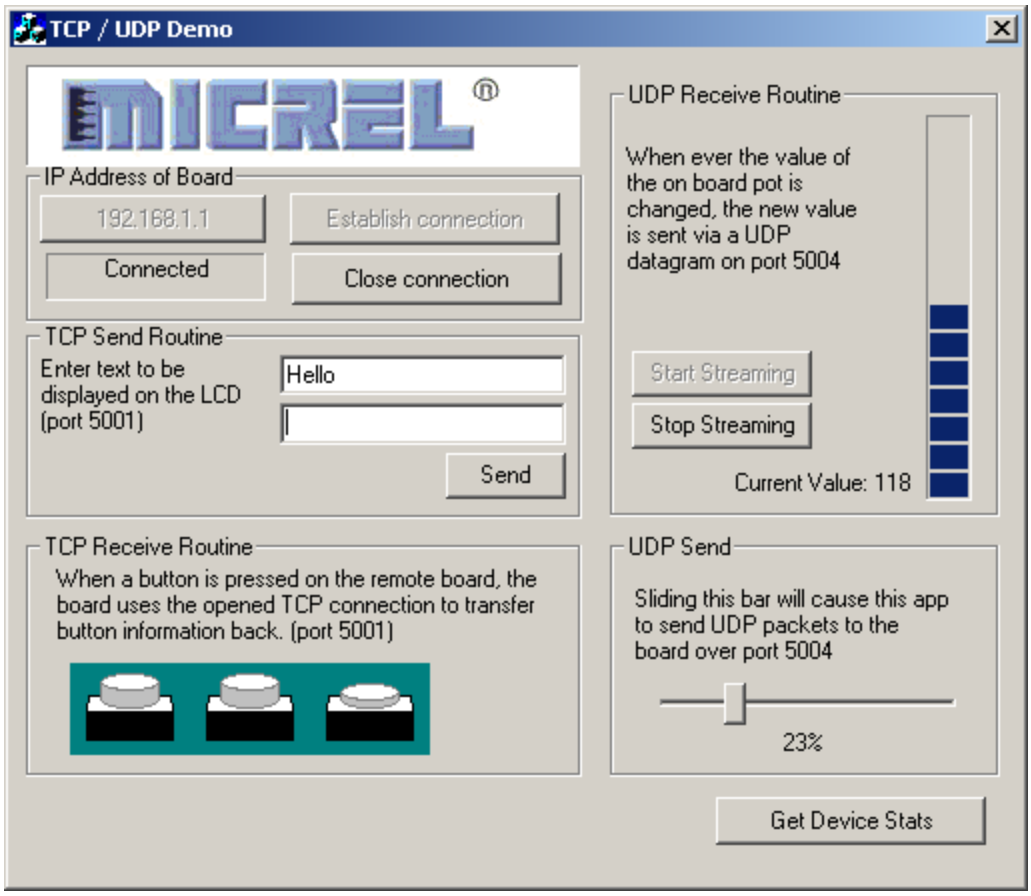
TCP / UDP Demo
IP Address of Board
192.168.1.1
Establish connection
Connected
Close connection
TCP Send Routine
Enter text to be displayed on the LCD (port 5001)
Hello
Send
TCP Receive Routine
When a button is pressed on the remote board, the board uses the opened TCP connection to transfer button information back. (port 5001)
UDP Receive Routine
When ever the value of the on board pot is changed, the new value is sent via a UDP datagram on port 5004
Start Streaming
Stop Streaming
Current Value: 118
UDP Send
Sliding this bar will cause this app to send UDP packets to the board over port 5004
23%
Get Device Stats

Figure 8: Receive and Transmit TCP/UDP Packets for Demonstration

7 Hardware Description

7.1 Memory Map

The default base address for the KSZ88XX-16 MQL Demo Board is 0x300 without the EEPROM. Due to CS2 is used for the chip select of KSZ88XX-16 MQL, the system base address is 0x10300. If the EEPROM is used, the base address will download from the first two bytes of the EEPROM to register of the Ethernet chip on power up.
Please refer to the Table 8 for memory map and Table 9 for EEPROM format/content.

Table 8: Memory Map for The Demo Board

Range (16)	Size	Description
00000 – 003FF	1K	SFR
00400 – 09FFF	39K	Internal RAM and reserved
10000 – 26FFF	94K	CS2 for KSZ88XX-16 MQL
27000 – 27FFF	4K	Reserved
28000 – 2EFFF	28K	CS1 (No use)
30000 – 7FFFF	327K	CS0 for SRAM (option)
80000 - FFFFF	524K	Internal RAM and reserved

Table 9: EEPROM Format and Content

WORD	15 8	7 0
0H	Base Address	
1H	Host MAC Address Byte 2	Host MAC Address Byte 1
2H	Host MAC Address Byte 4	Host MAC Address Byte 3
3H	Host MAC Address Byte 6	Host MAC Address Byte 5
4H	Reserved	Reserved
5H	Reserved	Reserved
6H	ConfigParam (see Table 10)	
7H-3FH	Not used for KSZ8842M (available for user to use)	

Table 10: Format for The ConfigParam Word 6H

Bit	Bit Name	Description
15	NEW_CAP	Reserved.
14	NO_SRST	Reserved.
13	Reserved	Reserved.
12	PME_D2	Reserved.
11	PME_D1	Reserved.

10	D2_SUP	Reserved.
9	D1_SUP	Reserved.
8-6	Reserved	Reserved.
5	DSI	Reserved.
4	Reserved	Reserved.
3	Reserved	Reserved.
2	Reserved	Reserved
1	Clock_Rate	Internal clock rate selection (Note 1) 0: 125 MHz 1: 25 MHz
0	ASYN_8bit	**Async 8-bit or 16-bit bus selection** 1= Async bus is configured for 16-bit width 0= Async bus is configured for 8-bit width (32-bit bus, KSZ88xx-32MQL, don't care this bit setting)

Note 1: At power up, the Ethernet chip operates from the 125 MHz clock. The internal frequency can be dropped to 25 MHz via the external EEPROM. This clock rate selection is for new chip Rev-A2 only.

7.2 Board Reset

The KSZ88XX-16 MQL Demo Board generates a reset signal from the reset circuitry during power up. It also provides a push button S4 reset circuit to reset the whole Demo Board. At power up, the board is automatically reset. User can also press reset button S4 on the board for a manual reset. After any reset, the LED1 and LED2 flash to indicate the power on self-test, also the LCD module shows the HW/SW board status and system set up result.

7.3 Clock Scheme

The Ethernet chip reference clock is provided from external 25 MHz crystal (Y1). The crystal is connected to the X1 and X2 pins on the KSZ88XX-16 MQL. This 25 MHz clock is specified as +3.3V tolerant, +/- 50 ppm. If an oscillator is used, X1 connects to a 3.3V tolerant oscillator and X2 is no connection.
The M16C microcomputer receives two references clocks, one is the 12 MHz crystal, connected to Xout/Xin pins, the other is the 32 KHz crystal, connected to XCout/XCin pins. Both clocks are specified as +5.0V tolerant, +/- 100 ppm.

7.4 ESD Protection circuit

The Demo Board contains two levels of ESD protection circuitry (Option).

The first level of ESD protection uses D1/D2 (GBLC03C) for LAN port 1 RX/TX pairs and D3/D4 (GBLC03C) for LAN port 2 RX/TX pairs before the T1/T2 transformers. The second level of ESD protection uses U3 hybrid (SRV05-4) for LAN port 1 RX/TX pairs and U4 hybrid (SRV05-4) for LAN port 2 RX/TX pairs after the T1/T2 transformers.

7.5 POT1 and POT2

Adjust POT1 to change the contrast of the LCD display module.

Adjust POT2 to change the UDP receive value when streaming from Demo Board to PC on the demo software.

8 Bus Interface Connection

The KSZ88XX-16 MQL Demo Board provides a 16-bit bus interface to the M16C microcomputer. The external EEPROM is used to set up the bus width of the Demo Board. Figure 9 shows the 16-Bit Asynchronous Interface.

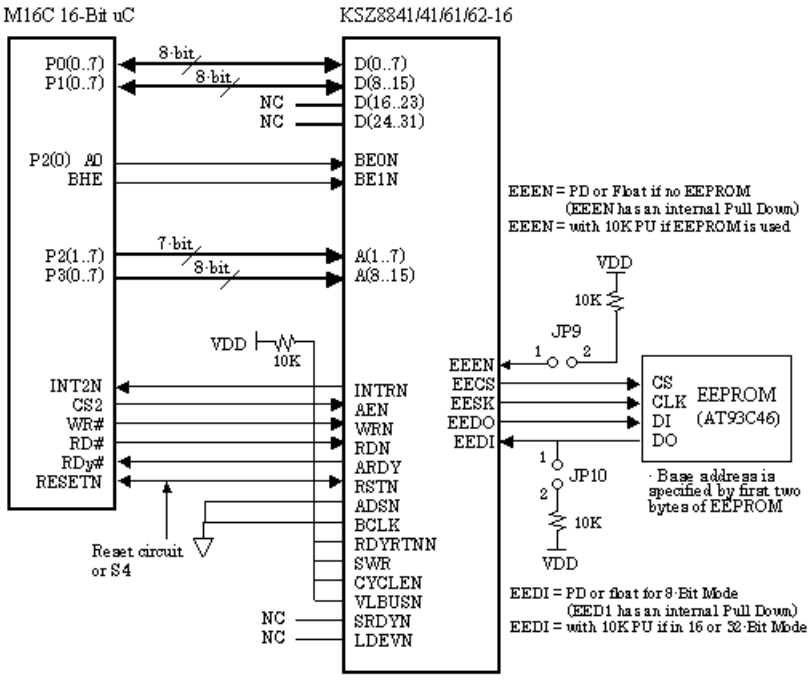

Figure 9: KSZ88XX-16 MQL 16-Bit Asynchronous Interface Block Diagram

9 External Interfaces

9.1 LAN Interfaces

9.1.1 Two 10/100Base-TX Fast Ethernet Ports

The LAN interfaces on the KSZ88XX-16 MQL are connected to a transformer (T1, T2) with 50ohm differential termination resistors for each port. The line side of the transformer is connected to the RJ-45 connectors (J1, J2) for LAN port 1 and port 2.

9.1.2 One 100Base-FX Fast Ethernet Port

With the additional circuitry, the LAN port 1 interface can also support 100Base-FX with a fiber optic module (U5). The 100Base-FX fiber optic mode is supported by KSZ886X-16 MQL only. To support fiber mode, 0 ohm resistors (R63, R65, R67, R69) need to be populated and 0 ohm resistors (R64, R66, R68, R70) need to be removed.
There is a 3-pin jumper (JP4) to select either +3.3V (pin 1-2) or +5V (pin 2-3) for the fiber optic module (U5) power.

9.2 UART

The KSZ88XX-16 MQL Demo Board provides an UART serial interface (P1) for serial data communication between hyper terminal and Demo Board.

9.3 ICD (In-Circuit Debugger)

This In-Circuit Debugger interface (J3) is used for USB debugger and FoUSB programmer downloading.

9.4 Power Jack

A +5V DC input is connected to the power jack J4 to supply the Demo Board.

9.5 Power Supply and Test Point

The Demo Board is supplied with +5.0V DC power through a jack (J4) and converted to +3.3V with a Micrel +3.3V voltage regulator (U9, MIC37152BR). The KSZ88XX-16 MQL contains an internal +1.2V LDO, to provide its core, analog and PLL voltages.
The Table 11 shows all test points information.

Table 11: All Test Points Description

Test Points	Comment
TP1	Power supply for 1.2V Analog VDDA
TP2	(Not exist)
TP3	LDEVN signal from KSZ88XX-16 MQL output
TP4	(Not exist)
TP5	Power supply for 3.3V digital VDDIO
TP6	Ground signal (GND)

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